

NEW TAXA IN CHRYSOTHAMNUS, SECTION NAUSEOSI (ASTERACEAE)

Loran C. Anderson

Florida State University, Tallahassee 32306

Chrysothamnus may be divided into four sections (Anderson, 1970). The most perplexing, taxonomically, is section *Nauseosi* which, as presently understood, consists of two polytypic species: *C. nauseosus* (Pallas) Britt. and *C. parryi* (Gray) Greene. A third species, *C. pyramidatus* (Robins. & Greenm.) H. & C. was placed in the section by Hall and Clements (1923) and has since been transferred to *Haplopappus* (Blake, 1926) and finally to *Baccharis* (Rzedowski, 1972). The section is characterized by its taxa having stems with densely compacted tomentum.

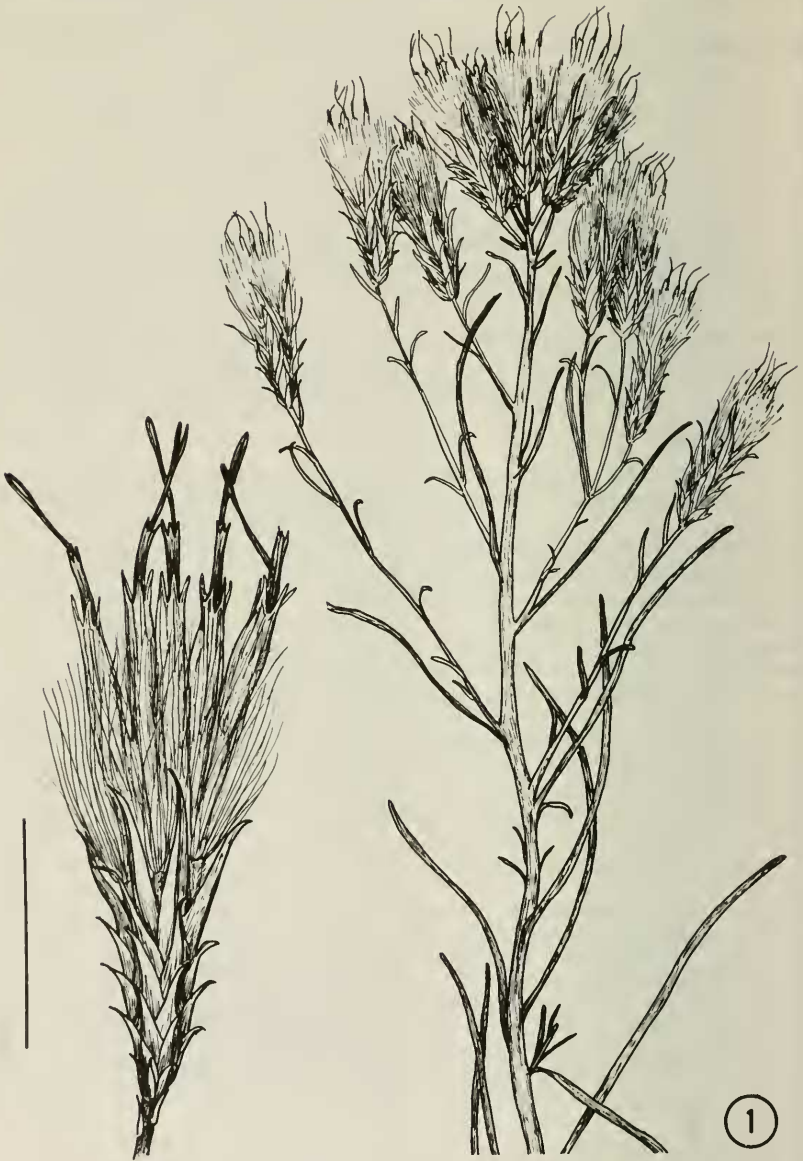
The two species are relatively easily distinguished from one another. *Chrysothamnus nauseosus* has numerous five-flowered heads compacted into cymose inflorescences (capitulescences), and the involucre bracts are strongly aligned vertically with generally obtuse, acute, or moderately acuminate tips. Typically, *C. parryi* has fewer heads per stem that are arranged in elongate, leafy inflorescences that are racemosely (rarely paniculately) distributed. The heads have 5-10 (20) flowers. The phyllaries, especially the outer ones, have slender, frequently spreading, herbaceous tips, and the bracts are not as strongly aligned in vertical rows.

The description of new taxa in this section comes only after long study and personal conviction that the new names are being applied to more than just trivial forms. I am fully aware of the sort of variety found in *C. nauseosus* to which Hall (1919) referred:

Nothing can be more certain than that these 42 [now over 50] attempts to recognize species and varieties do not by any means exhaust the resources of the group. Every autumnal excursion into a new district brings to light one or more forms not previously described. The only limits set to the number of new species or varieties which might be set up lie in one's ability to visit all parts of the field during the flowering period and the failure or disinclination to recognize minor variations.

All the new taxa are known chromosomally (Anderson, 1966, 1971), and several have distinctive floral anatomy (Anderson, 1970).

CHRYSOTHAMNUS NAUSEOSUS ssp. ARENARIUS



Some of the new subspecies described here necessitate additional clarification as to the differences between the species. Specimens of *C. nauseosus* ssp. *arenarius* have been confused with *C. parryi* by some because of their long attenuate, acuminate phyllaries. The subspecies clearly belongs to *C. nauseosus* in that the involucre has very distinct vertical alignment of the phyllaries which are also prominently keeled and chartaceous. Additionally, the habitat preference and growth form are more compatible with those found in *C. nauseosus*. On the other hand, *C. parryi* ssp. *salmonensis* has involucre that approach *C. nauseosus* in size and phyllary shape. The phyllaries are only moderately acuminate, but they are poorly keeled and weakly aligned as in *C. parryi*. Furthermore, the phyllaries have more membranous, herbaceous tips compared to the generally more chartaceous condition of phyllary tips in *C. nauseosus*.

The new subspecies are described below and illustrated in Fig. 1-5. The individual heads in the illustrations are each scaled with a 1 cm vertical line; other aspects of the illustrations are not drawn to any particular scale. Known ranges of the taxa are mapped in Fig. 6.

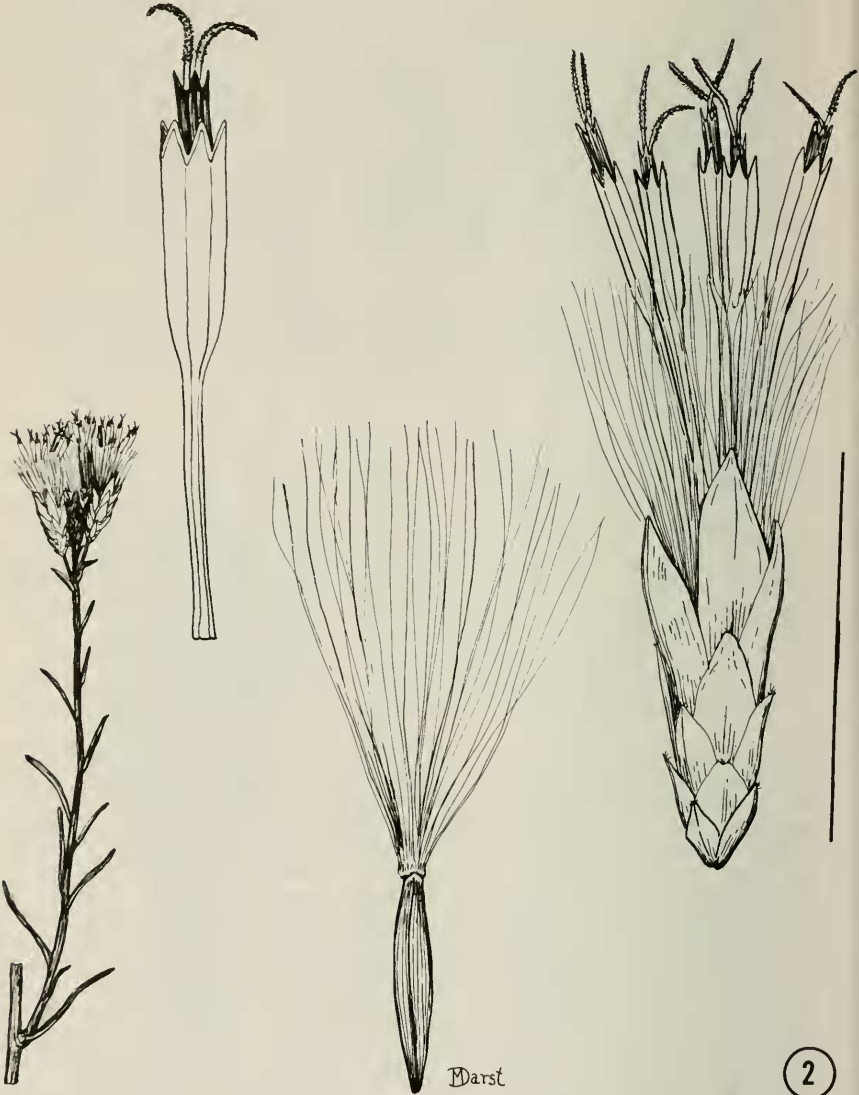
Chrysothamnus nauseosus ssp. arenarius L. Anderson, ssp. nov.

Frutices corpulenti, usque ad 1.2 m alti; folia glauco-viridia, linearia, 4-7.5 cm longa, 1 mm lata; inflorentia cyma paniculata; capitula 15-20 mm longa, bracteis involucralibus apicibus cuspidato-aristatis recte ordinatis carinatisque magne; disci florum 5, flavi, corollis 12-14.2 mm longis, lobis 1.2-2 mm longis, lineis stigmaticis styli appendicibus brevioribus; achaenia pubescentia.

TYPE: Arizona, Coconino Co., 0.5 mi E of The Gap, 22 Sep 1959, L. C. Anderson 1849 (FSU!, KSC!, MSC!, UC-holotype!).

Large shrubs, 0.7-1.2 m tall; twigs stout, somewhat fastigiate branched, tomentose; leaves grayish-green, alternate, entire, linear with apiculate tips, 4-7.5 cm long, 1 mm wide, sparse, somewhat reduced toward the inflorescence, tomentose; inflorescence a loosely paniculate, round-topped cyme; heads large, cylindrical, (15) 16-19 (20) mm long, phyllaries (19) 22-25 (27), strongly aligned and keeled with prominent costal vein, chartaceous, margins ciliate, tips cuspidate-aristate, glabrescent, outer bracts subulate, inner ones lanceolate and slightly spreading or recurved; disk flowers 5, yellow, corollas ventricose with the narrow tube abruptly dilated to a much broader throat, (12) 12.5-13.2 (14.2) mm long, lobes broadly lanceolate, 1.2-2 mm long, styles long exerted, up to 19 mm long, style branches frequently appressed rather than widely spreading, stigmatic portion 35-45% of total style branch length; achenes cylindrical, 7-9 mm long, pubescent, pappus of capillary bristles; n = 9 (Fig. 1).--- Infrequent on sandhills, often those formed at bases of high sandstone cliffs, 5,000-6,500 ft, se. Utah, ne. Ariz., and nw. N.M. (Fig. 6, area A). Sep-Oct.

CHRYSOTHAMNUS NAUSEOSUS ssp. NITIDUS



This subspecies is easily distinguished from others of *C. nauseosus* by its large heads with strongly keeled, cuspidate involucre bracts; these features were maintained when plants were garden-grown in Logan, Utah. It looks like no other subspecies but is probably closely related to *C. nasuosus* ssp. *turbinatus*—the two form hybrid swarms locally in Kane Co., Utah. The strong, flexible stems are reportedly used by the Navajo Indians in weaving baskets.

Additional specimens examined: Utah, Grand Co., *S. L. Welsh & G. Moore* 2764 (BRY, FSU, NY), *J. Allan* 203 (BRY, FSU); Kane Co., *L. C. Anderson* 1723, 1776 (FSU, KSC, MSC), *S. L. Welsh & K. Thorne* 13017 (BRY, FSU, WTS); Washington Co., *A. Eastwood & J. T. Howell* 6346 (CAS, US), *A. M. Woodbury* in 1925 (UT). Arizona, Apache Co., *B. S. Klinger* 95 (NMC); Coconino Co., *L. C. Anderson* 1756, 1797 (FSU, KSC, MSC), *Cutler, Goodman & Payson* in 1939 (DS); Navajo Co., *L. C. Anderson* 1886, 2668 (FSU, KSC), *A. M. Woodbury* in 1937 (UT). New Mexico, Rio Arriba Co., *B. S. Klinger* 210 (FSU, NMC); San Juan Co., *J. T. Wynhoff* 418 (ASU).

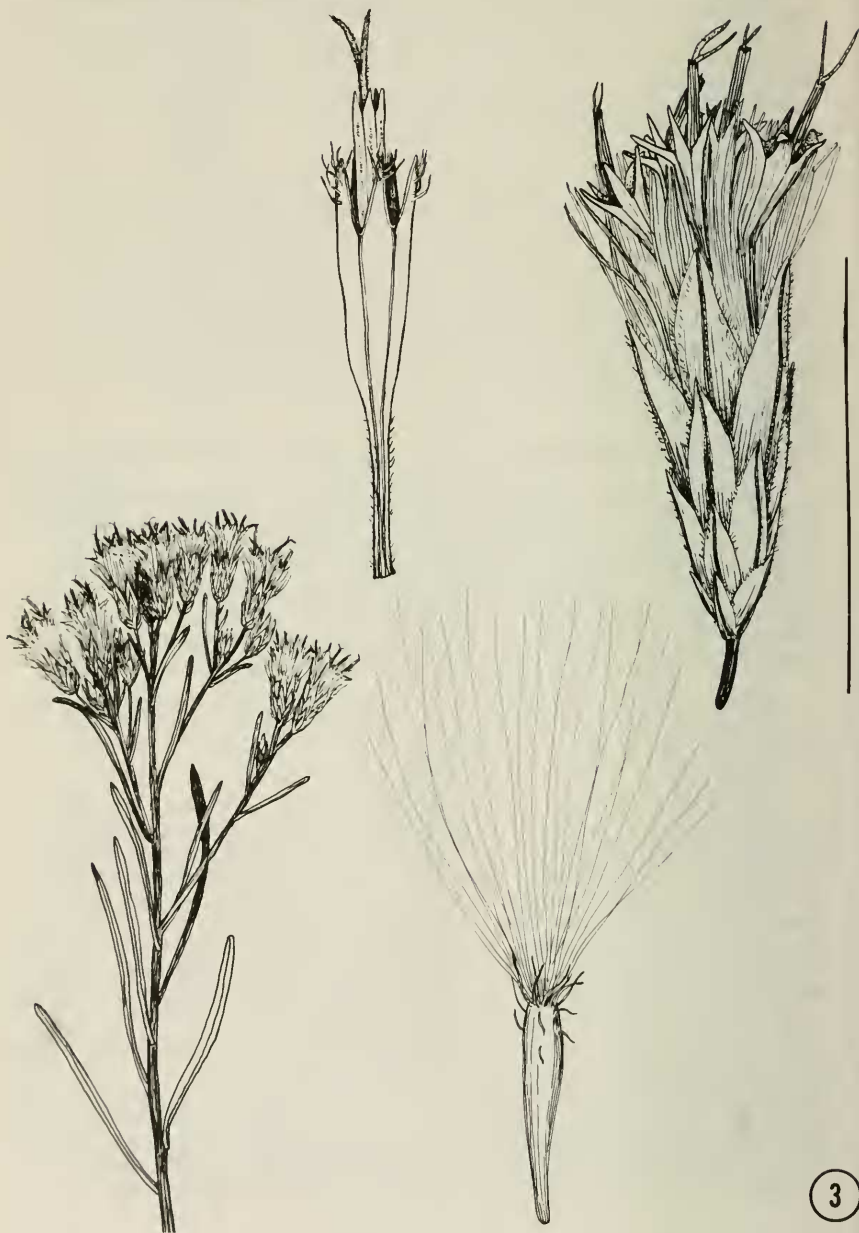
Chrysothamnus nauseosus ssp. *nitidus* L. Anderson, ssp. nov.

Frutices usque ad 1.5 m alti; stirpes et frondes galbinae; folia linearia, 1–5 cm longa, 1–1.5 mm lata; inflorescentia cyma paniculata; capitula 10–12.5 mm longa, bracteis involucrelibus 13–19, exterioribus interdum tomento appresso ovatis, interioribus ellipticioribus, glabris, lucidis; disci florum 5, subflavi, corollis 9.8–10.5 mm longis, lobis circa 1 mm longis, interdum subvillosis, lineis stigmaticis styli appendicibus parvo brevioribus vel paene paribus longitudine; achaenia saepissime glabra, raro pubescentia.

TYPE: Arizona, Coconino Co., 7 mi N of Cedar Ridge Trading Post in Cornfield Valley of Tanner Wash, 16 Oct 1958, *L. C. Anderson* 1739 (FSU!, KSC!, MSC!, UC—holotype!).

Shrubs 0.6–1 (1.5) m tall with many stems arising from the base of the plant, stems and foliage yellowish-green and pleasantly fragrant; leaves alternate, entire, linear, slightly involute, (1) 3–5 cm long, 1–1.5 mm wide, somewhat arcuate with mucronate tips; inflorescence often compact, a more or less flat-topped paniculate cyme; heads 10–12.5 mm long, phyllaries (13) 14–18 (19), the outer ones ovate with appressed tomentum or tomentulose, inner bracts elliptic with acute or obtuse tips, weakly keeled, glabrous, stramineous and shining, translucent, receptacle with a central cusp up to 2 mm long; disk flowers 5, pale yellow, corollas (9.5) 10–10.5 (11) mm long, lobes broadly lanceolate, not spreading, 0.7–1 mm long, sometimes villous, stigmatic lines shorter than style appendages (33–45% of total style branch length); achenes cylindrical, 5.5–6.5 mm long, brownish, usually glabrous but each large population has some plants with pubescent achenes, pappus of capillary bristles; $n = 9$ (Fig. 2).--- Locally common in sandy gravel of dry creek beds, 4,500–5,800 ft, extreme sc. Utah and adjacent n. Arizona (Fig. 6, area N). Oct.

CHRYSOETHAMNUS NAUSEOSUS ssp. WASHOENSIS



These plants form attractive displays in the dry washes along hiway 89 in northern Arizona; they can be spotted easily by their distinctive yellowish-green herbage that is enhanced by the shining stramineous bracts and pale yellow flowers. Hall and Clements (1923) noted that several forms of *C. nauseosus* had pleasant fragrances perhaps worthy for a perfume base; this taxon has the most pleasing aroma of all *C. nauseosus* subspecies.

Not all plants have glabrous achenes. Twenty plants of each population that I visited were checked for achene pubescence; the populations had 80–95% glabrous-achened plants.

This taxon shows affinity to ssp. *leiospermus* and ssp. *bigelovii* in its glabrous achenes and to ssp. *hololeucus* (the gnaphalodes form) in its short corolla lobes. A close relationship to the glabrous-achened ssp. *glareosus* is not likely; however, Hall and Clements (1923) cited a specimen from Coconino Co., Arizona, in their description of ssp. *glareosus* that is very probably a specimen of ssp. *nitidus* (which caused their description of ssp. *glareosus* to be very close to that of the new subspecies). Although extant specimens of "good" ssp. *glareosus* have not been found, Jones' description (1891) clearly shows that the two entities are distinct. He stated those plants were about a foot high and had phyllaries with conspicuous thickened yellow tips and linear-lanceolate corolla lobes—none of these features agree with ssp. *nitidus*.

Additional specimens examined: Arizona, Coconino Co., L. C. Anderson 1751, 1752, 1753, 1745 (FSU, KSC, MSC), 1798 (same plant as the type, in winter condition, FSU, KSC), D. Demaree 39910 (FSU), L. N. Goodding 4367 (NMC); Navajo Co., L. C. Anderson 1887 (FSU, KSC, MSC), G. W. Plumb 24 (NMC). Utah, Kane Co., L. C. Anderson 1868 (FSU, KSC, MSC). The following may represent both geographically and morphologically peripheral populations of this taxon: M. E. Jones 4511 (CAS, DS, GH, NY, ORE, UC, US) from Apache Co., Arizona, and S. L. Welsh & K. Thorne 13018 (BRY, FSU, WTS) from Kane Co., Utah—both have pubescent achenes and less typical involucre.

Chrysothamnus nauseosus ssp. washoensis L. Anderson, ssp. nov.

Frutices usque ad 1 m alti, saepissime minores quam 5 dm, fastigate ramosi; folia glauco-viridia, spatulata vel anguste ob-lanceolata, 3–3.5 cm longa, usque ad 3 mm lata; inflorentia cyma paniculata; capitula 10–12 mm longa, bracteis involucralibus 16–20 vel pluribus, exterioribus bracteis aequae rare villosis et pertomentosis; disci florum saepissime 5, flavi, corollis plurimis 8–9 mm longis, lobis circa 1.5 mm longis et villosis, lineis stigmaticis styli appendicibus brevioribus; achaenia ipsa glabra sed multis pilis pilosis albis prope pappum locatis.

TYPE: Nevada, Washoe Co., dry rocky silty clay of open juniper grassland, Barrel Springs near California line, 22 air mi NW of Vya, 31 Jul 1972, L. C. Anderson 3573 (FSU!, KSC!, UC—holotype!)

CHRYSOTHAMNUS PARRYI ssp. SALMONENSIS



Shrubs 3–4.5 (10) dm tall, more or less fastigiate branched; leaves gray-green, alternate, entire, spatulate to narrowly oblanceolate, 3–3.5 cm long, 2–3 mm wide, tips mucronate; inflorescence a paniculate cyme; heads (10) 11–11.5 (12) mm long, phyllaries (16) 18–20 (30), outer ones sparsely villose as well as closely tomentose, ovate, inner bracts tomentulose with prominent (often brownish) costal nerves, elliptic with obtuse to acute tips, receptacular cusp up to 3 mm high; disk flowers (4) 5 (6), yellow, corollas (7.5) 8–9 (10) mm long, lobes about 1.5 mm long, narrowly lanceolate, villous, stigmatic lines shorter than style appendages (33–45% of total style branch length); achenes cylindric, lustrous brown, 4.5–5 mm long, essentially glabrous but with tuft of long white pilose hairs forming a crown just below the pappus attachment, pappus of capillary bristles; $n = 9$ (Fig. 3).---Infrequent in rocky poor soil of open juniper or piñon grassland, 5,000–5,400 ft, w. Washoe Co., Nevada, and adjacent Calif. (Fig. 6, area W). Aug.

This subspecies has a unique set of features that include longer hairs associated with the tomentum on the involucreal bracts, villose corolla lobes, and glabrous achenes with the distal crown of white villose-pilose hairs. An elevated receptacular cusp is found sporadically in the genus and has no apparent taxonomic value. With its glabrous achenes, it was first considered an aberrant form of ssp. *leiospermus* (Anderson, 1971), but I now consider it very distinct from the other subspecies with its closest affinity to ssp. *albicaulis*.

Additional specimens examined: California, Lassen Co., H. M. Hall 11676, 11677 (UC), R. F. Hoover 4646 (JEPS, UC); Modoc Co., L. C. Wheeler 3967 (GH, ND). Nevada, Washoe Co., L. C. Anderson 3574, 3577 (FSU, KSC), H. Summerfield & B. Price 68-07, 68-08 (FSU), M. Williams 74-20-2 (CAS, NY), M. Williams & A. Tiehm 74-74-71 (CAS, NY).

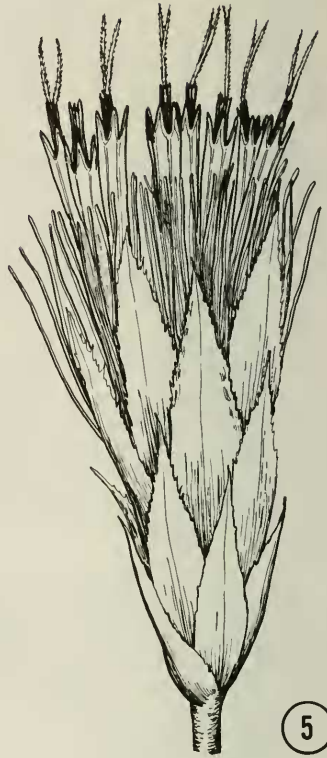
Chrysothamnus parryi ssp. salmonensis L. Anderson, ssp. nov.

Frutices stirpibus gracilibus usque ad 6 dm alti; folia viridia, linearia vel anguste oblanceolata, 3–8 cm longa, 1–3 mm lata; inflorescentia frondosa et elongata, cyma racemose vel paniculate ramosa; capitula 10–12 mm longa, bracteis involucrealibus plurimis 13–17, apicibus longis acuminatis; disci florum 4–6, subflavi, corollis 8–10 mm longis, lobis 1–1.5 mm longis, lineis stigmaticis styli appendicibus brevioribus; achaenia pubescentia.

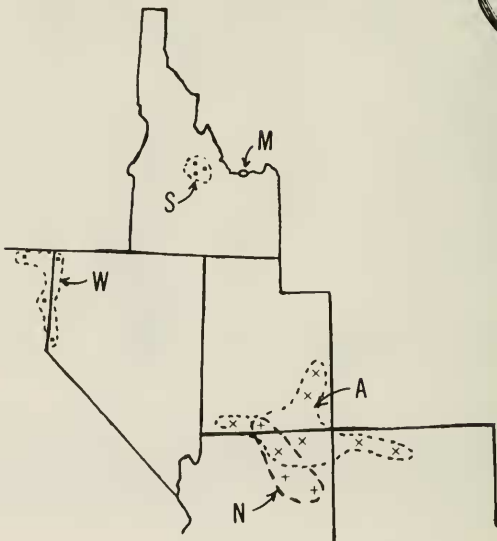
TYPE: Idaho, Custer Co., barren, gravelly hillside overlooking Salmon River, 4 mi SE of Challis, 26 Aug 1958, L. C. Anderson 1661 (FSU!, KSC!, MSC!, UC–holotype!).

Shrubs 3–6 dm tall with slender, more or less fastigate branches, herbage slightly viscidulous; leaves green, alternate, entire, linear to narrowly oblanceolate, 3–5 (8) cm long, 1–2 (3) mm wide, sparse; inflorescence leafy and elongate, a racemose to paniculate cyme; heads cylindric, 10–12 mm long, phyllaries (11)

CHRYSOTHAMNUS PARRYI ssp. MONTANUS



5



6

13-17 (19), viscidulous, outer ones broadly lanceolate with ciliate margins and acuminate, herbaceous tips, inner bracts narrowly lanceolate with acuminate tips; disk flowers (4) 5-6, pale yellow, corollas mostly 8-10 mm long, lobes 1-1.5 mm long, stigmatic lines shorter than the style appendages (35-42% of total style branch length); achenes cylindrical, 5.5-6.5 mm long, pubescent; n = 9 (Fig. 4).---Frequent on barren rocky soil along Middle Fork of Salmon River and its tributaries, 4,800-5,900 ft, c. Idaho endemic (Fig. 6, area S). Aug-Sep.

This subspecies is most closely related to *C. parryi* ssp. *attenuatus* from which it differs in having more slender stems with relatively longer internodes and sparser foliage; the heads have more bracts and fewer flowers as well as shorter involucre and corollas than in ssp. *attenuatus*. Garden-grown plants in Logan, Utah, and Claremont, California, had larger heads with more numerous flowers, but the distinctness from ssp. *attenuatus* was still observable.

Additional specimens examined: Idaho, Custer Co., *L. C. Anderson* 1658, 1660, 1662 (FSU, KSC, MSC), *J. H. Christ* 51-183, 51-197 (ID), *A. Cronquist* 3808, 3810 (MO), 6808 (DS, FSU, NY, TEX, UTC), *J. F. Macbride & E. B. Payson* 335 (CAS, DS, ID, NY, RM, UC); Lemhi Co., *L. C. Anderson* 1666, 1667 (FSU, KSC, MSC).

Chrysothamnus parryi ssp. montanus *L. Anderson*, ssp. nov.

Frutices humiles et patuli usque ad 3 dm alti, contorte ramosi; folia viridia, linearia 2-3.5 cm longa, 1-2 mm lata, superiora racemosas cymas paucis capitulis superantia; capitula 10-11.5 mm longa, bracteis involucribus plurimis 13-17, marginibus subciliatis acuminatisque, apicibus herbaceis, subviscidis, plus minusve in ordinibus rectis; disci florum plurimi 5-11, flavi, corollis 9-10 mm longis, lobis circa 1.5 mm longis; styli varii lineis stigmaticis multo brevioribus vel etiam parvo longioribus quam styli appendicibus; achaenia pubescentia.

TYPE: Idaho, Clark Co., exposed rocky slopes of Red Conglomerate Peaks, Irving Creek drainage, 28 air mi NW of Dubois, 14 Sep 1957, *L. C. Anderson* 1024 (FSU!, KSC!, MSC!, UC-holotype!).

Low, spreading shrubs, 1-2 (3) dm tall, intricately branched; leaves green, alternate, entire, linear, 2-3.5 cm long, 1-2 mm wide, viscidulous, upper ones surpassing the few-headed cymose inflorescence; heads 10-11.5 mm long, involucre bracts (11) 13-17 (18), viscidulous, more or less in vertical rows, outer bracts lanceolate-ovate with ciliate margins and long acuminate, herbaceous tips, inner ones broadly lanceolate-elliptic with acuminate tips; disk flowers (4) 5-11 (12), yellow, corollas 9-10 mm long, lobes 1.4-1.7 mm long, broadly lanceolate, styles variable with stigmatic lines much shorter to slightly longer than the style appendages (27-52% of total style branch length); achenes 8 mm long, pubescent; n = 9 (Fig. 5).---Locally common on open, rocky sites just below timberline,

9,500 ft, known only from Red Conglomerate Peaks of Idaho-Montana state line (Fig. 6, area M). Aug-Sep.

This very local endemic has been considered related to *C. parryi* ssp. *parryi* because of its many-flowered heads (Anderson, 1970); actually, individual plants vary in average flower number per head from 5.5 to 9.5. Garden-grown plants maintain their characteristic growth habit and average flower number per head, whereas their inflorescences vary. Plants grown in Logan, Utah, and Claremont, California, generally had larger, racemosely to paniculately branched cymes with somewhat shorter heads. They look more like ssp. *howardii* or ssp. *attenuatus* rather than ssp. *parryi*. The closest relationship seems to be with ssp. *howardii* from which ssp. *montanus* differs in having lower shrubs with greener, more viscid foliage, less tomentum in the involucre, and larger flowers that are generally more numerous in each head.

Additional specimens examined: Idaho, Clark Co., L. C. Anderson 1022 (FSU, KSC), A. Cronquist 1940 (MO, UTC).

ACKNOWLEDGEMENTS

Line drawings were made by Melanie Darst. Dr. Walter Forehand is thanked for assistance with the latin diagnoses. This study was supported by National Science Foundation grant DEB 76-10768.

LITERATURE CITED

- Anderson, L. C. 1966. Cytotaxonomic studies in *Chrysothamnus* (Astereae, Compositae). *Amer. J. Bot.* 53:204-212.
- _____. 1970. Floral anatomy of *Chrysothamnus* (Astereae, Compositae). *Sida* 3:466-503.
- _____. 1971. Additional chromosome numbers in *Chrysothamnus* (Asteraceae). *Bull. Torrey Bot. Club* 98:222-225.
- Blake, S. F. 1926. Compositae, in P. C. Standley, Trees and shrubs of Mexico. *Contrib. U. S. Nat. Herb.* 53:204-212.
- Hall, H. M. 1919. *Chrysothamnus nauseosus* and its varieties. *Univ. Calif. Publ. Bot.* 7:159-181.
- _____, and F. E. Clements. 1923. The phylogenetic method in taxonomy. The North American species of *Artemisia*, *Chrysothamnus* and *Atriplex*. *Carnegie Inst. Publ.* 326:1-355.
- Jones, M. E. 1891. New species and notes of Utah plants. *Zoe* 2: 236-252.
- Rzedowski, J. 1972. Tres adiciones al genero *Baccharis* (Compositae) en Mexico. *Brittonia* 24:398-402.